

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No. : **10/537089**
Applicant : Weigel
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Title : Apparatus and Method for Reducing the Current Drawn During
Starting of a Single-Phase AC Asynchronous Motor
TC/A.U. : 2837
Examiner : **Duda**
Docket No. : **5672**
Customer No. : 26936

Commissioner for Patents
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AMENDMENT

Sir:

Please amend this application as follows:

Amendments to the Claims:

1. (currently amended) An apparatus for reducing the current drawn during starting of a single-phase AC asynchronous motor, having an auxiliary winding and having a main winding, which apparatus has an NTC thermistor which can be connected in series with the main winding, characterized in that the NTC thermistor can effectively be connected in series with the main winding at the start of the switching-on process in order to limit the starting current through the main winding, and with the NTC thermistor not limiting the starting current through the auxiliary winding.
2. (currently amended) The apparatus as claimed in claim 1, further comprising a starting circuit with a starting capacitor for producing a phase shift in the auxiliary winding arranged such that it can be connected in series with the auxiliary winding, and a PTC thermistor for limiting capacitive current surges through the starting capacitor in series with the starting capacitor.
3. (currently amended) The apparatus as claimed in claim 1, further comprising a starting circuit with a starting capacitor for producing a phase shift in the auxiliary winding arranged such that it can be connected in series with the auxiliary winding, and ~~an~~ a further NTC thermistor for limiting capacitive current surges through the starting capacitor in series with the starting capacitor.
4. (currently amended) The apparatus as claimed in claim 1, further comprising a circuit breaker switch in order to bridge the NTC thermistor after completion of the starting process.
5. (currently amended) The apparatus as claimed in claim 1, further comprising a circuit breaker switch in order to switch off the starting circuit.

6. (currently amended) The apparatus as claimed in claim 1, further comprising a control arrangement for switching ~~switches~~ the circuit breaker switch and the starting circuit switch on and off as a function of time.
7. (currently amended) The apparatus as claimed in claim 6, wherein the control arrangement is designed such that π the circuit breaker switch in order to switch off the starting circuit can be operated before π the circuit breaker switch in order to bridge the NTC thermistor.
8. (previously presented) The apparatus as claimed in claim 2, further comprising an operating capacitor for producing a phase shift in the auxiliary winding with respect to the main winding in the operating state, wherein the capacitance of the starting capacitor is greater than the capacitance of the operating capacitor.
9. (previously presented) The apparatus as claimed in claim 2, wherein the capacitance value of the starting capacitor is at least twice as great as the capacitance value of the operating capacitor.
10. (previously presented) The apparatus as claimed in claim 1, wherein the NTC thermistor has a cold resistance of 10 to 30 Ω .
11. (currently amended) A method for reducing the starting current on switching on a single-phase AC asynchronous motor, said method comprising steps of, reducing, on switching on, the current through the main winding of the motor by means of an NTC thermistor, and bridging the NTC thermistor by means of a circuit breaker switch after starting of the motor.

12. (currently amended) The method as claimed in claim 11, comprising a further step of producing a starting phase shift in ~~the~~ an auxiliary winding of the motor during the starting process with a starting capacitor, and reducing the current through the starting capacitor at the moment of being switched on with a resistor.

13. (currently amended) The method as claimed in claim 12, wherein the resistor and the starting capacitor are disconnected from the circuit by means of a circuit breaker switch on reaching rated operation, before the NTC thermistor is bridged by means of ~~a~~ the circuit breaker switch.

14. (previously presented) The method as claimed in claim 11, wherein the current through the main winding is increased continuously during the starting process, while the current through the starting capacitor and the degree of phase shift produced by the starting capacitor are increasingly reduced.

15. (previously presented) An apparatus as claimed in claim 9, wherein the capacitance value of the starting capacitor is three to five times as great as the capacitance value of the operating capacitor.

16. (previously presented) A method as claimed in claim 11, wherein the bridging step is done on or after reaching rated operation.

17. (new) An apparatus as claimed in claim 4, further comprising a starting circuit switch in order to switch off the starting circuit.

Remarks/Arguments:

This is a response to the Office Action dated January 8, 2007.

The amendments are submitted without prejudice and without abandonment of subject matter.

With respect to item 3 of the office action, the claims have been amended for the purpose of increasing clarity. Specifically, switch 6 and switch 10 are now denoted with a name defining their position or function. Thus, switch 6 is now referred to as the “circuit breaker switch” because it bridges the NTC thermistor. Basis for this amendment is found at page 6 final paragraph of the application as filed. Switch 10 is now referred to as the "starting circuit switch" because it switches the starting circuit on and off. Basis for this amendment is found in claim 5 of the application as filed.

Claim 3 has now been amended to distinguish between the NTC thermistor 5 and the NTC thermistor 9' in the starting circuit of Figure 1b. NTC thermistor 9' is now referred to as the “further resistor”.

New claim 17 is similar to claim 5, but depends from a different claim.

With reference to item 5 of the office action, the applicant wishes to draw attention to the most important features of the apparatus of the present invention as claimed in claim 1. Specifically, the apparatus of claim 1 requires

“...that the NTC thermistor can effectively be connected in series with
the main winding at the start of the switching on process...”

This feature is neither shown nor suggested in the control circuit of Pfarrer et al. Column 5 lines 33 to 39 of the Pfarrer citation discusses operation of the low speed windings:

“Considering the operation of FIG. 4, when the low speed contactor is energized, contacts 16A, 16B and 16C are closed and power is supplied from lead line L1 through the start capacitor 30, negative temperature coefficient thermistor 60, normally closed contact 24A, contact 16C, low speed winding 14, and contact 16A to lead line L2.”

Whereas column 5 lines 39 to 41 of the Pfarrer citation discusses operation of the high speed winding:

“The main winding 10 is energized through lead line L1, contact 16B, main winding 10 and contact 16A.”

There is no indication that the NTC thermistor 60 is part of this latter path. This is because the arrangement of resistors, capacitors, and an NTC thermistor (reference numerals 20, 26, 28, 30, 18e, 60) functions solely to control the high and low speed start windings (12, 14) as specified in the description at column 5 lines 33 to 39, and have no influence on the main winding during the switching on process. Further, the NTC thermistor of Figure 4 of Pfarrer cannot be connected in series with the main winding.

Claim 1 continues “in order to limit the starting current through the main winding”.

Again, this feature cannot be identified in Pfarrer. Column 5, lines 41 to 44 merely states that when the low speed contractor (namely contacts 16A, 16B, and 16C) is energized the thermistor has a high resistance in its cold state, thereby limiting the current flow and reducing the start capacitance. The thermistor in Figure 4 of Pfarrer is concerned solely with the operation of the high and low speed start windings and not the main winding.

Independent method claim 11 of the present application recites the feature of
“reducing, on switching on, the current through the main winding of the
motor by means of an NTC thermistor,...”.

As discussed in the above paragraph (albeit in respect of the apparatus claim), no hint or suggestion of such a method step is described in Pfarrer.

Thus, the applicant submits that claims 1 and 11 (and by virtue of their dependency, claims 2 - 10 and 12 - 17) as written are novel in light of the Pfarrer et al. citation.

The following comments pertain to item 7 of the Office Action.

The differences between claim 2 of this application and the alleged closest prior art, Pfarrer et al., are at least those set out in the above novelty arguments. Thus, to reiterate, Pfarrer et al. essentially provides an RC system (reference numerals 20, 26, 28, 30, 18e, 60) which facilitates the starting of rotation of the motor. This is achieved by shifting capacitance and thereby changing the phase shift between the main winding and auxiliary winding. If the skilled person were aware of Figure 2 of U.S. Patent 3,737,752 (Strachan) which discloses a capacitor start and capacitor run device for controlling the power supplied to the windings of an electric motor, they would have no reason to consider utilizing these teachings in conjunction with the teachings of Pfarrer et al. This is so because there is no conceivable combination of these two prior art teachings that would achieve the aim and function of the present invention, namely avoiding drawing an excessively high current from the network through the main winding during the starting of the motor (see page 2, second paragraph of the application in suit).

Moreover, even if the skilled man were to consider utilizing the teachings of Strachan by integrating the power controlling device to the circuit of Pfarrer et al., this would not provide the circuit claimed in claim 2 of the application in suit. The features of an

“...NTC thermistor connected in series with the main winding at the start of the switching on process in order to limit the starting current through the main winding,...”

would still be absent from the integrated device.

The applicant submits that the obviousness objections raised against claims 3, 8 - 12 and 14 - 17 are also overcome for the reasons advanced above.

Thus, it is respectfully submitted that current claims 1 - 17 are novel and non obvious over the prior art, and that this application is in proper condition for allowance.

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